NOTICES OF PUBLIC INFORMATION

Notices of Public Information contain corrections that agencies wish to make to their notices of rulemaking; miscellaneous rulemaking information that does not fit into any other category of notice; and other types of information required by statute to be published in the *Register*. Because of the variety of material that is contained in a Notice of Public Information, the Office of the Secretary of State has not established a specific format for these notices.

NOTICE OF PUBLIC INFORMATION

DEPARTMENT OF ENVIRONMENTAL QUALITY

[M10-340]

1. A.R.S. Title and its heading: 49, The Environment
A.R.S. Chapter and its heading: 2, Water Quality Control
A.R.S. Article and its heading: 2.1, Total Maximum Daily Loads
Section: A.R.S. § 49-234, Total maximum daily loads; implementation plans

2. The public information relating to the listed statute:

Pursuant to A.R.S. § 49-234, the Arizona Department of Environmental Quality (Department or ADEQ) is required to develop a total maximum daily load (TMDL) for navigable waters that are listed as impaired. The purpose of this notice is to publish the Department's determinations of total pollutant loadings for TMDLs in the Lake Mary Region that the Department intends to submit to the Regional Administrator for Region 9, U.S. Environmental Protection Agency (EPA) for approval.

The Department previously provided public notice and an opportunity for public comment on the draft "Lake Mary Regional TMDL For Mercury in Fish Tissue: Upper Lake Mary, Lower Lake Mary, Soldiers Lake, Soldiers Annex Lake, and Lower Long Lake" in *Arizona Daily Sun*, a newspaper of general circulation in Flagstaff, on June 23, 2010. The public comment period ended on July 23, 2010. The Department received comments from the EPA. The purpose of this notice is to satisfy A.R.S. §§ 49-234(D) and 49-234(E), which require the Department to publish in the *Arizona Administrative Register* (A.A.R.) the determination of total pollutant loadings that will not result in impairment and the proposed allocations among the contributing sources that are sufficient to achieve the total pollutant loadings.

3. Total Maximum Daily Loads (TMDLs):

A. TMDL Process

A TMDL represents the total load of a pollutant that can be assimilated by a waterbody on a daily basis and still meet the applicable water quality standard. The TMDL can be expressed as the total mass or quantity of a pollutant that can enter the waterbody within a unit of time. In most cases, the TMDL determines the allowable mass per time (i.e. pounds per day) of a pollutant and divides it among the various contributors in the watershed as wasteload (i.e., point source discharge) and load (i.e., nonpoint source) allocations. The TMDL must also account for natural background sources and provide a margin of safety. For nonpoint sources such as accelerated erosion or internal nutrient cycling, it may not be feasible or useful to derive a figure in terms of pounds per day. In such cases, a percent reduction in pollutant loading may be proposed.

In Arizona, as in other states, changes in standards or the establishment of site-specific standards are the result of ongoing science-based investigations or changes in toxicity criteria from EPA. Changes in designated uses and standards are part of the surface water standards triennial review process and are subject to public review. Standards are not changed simply to bring the waterbody into compliance, but are based on sound science that includes evaluation of the risk of impact to humans or aquatic and wildlife. Existing uses of the waterbody and natural conditions are considered when standards for specific water segments are established.

These TMDLs meet or exceed the following EPA Region 9 criteria for approval:

Plan to meet State Surface Water Quality Standards: The TMDLs include a study and a plan for the specific pollutants that must be addressed to ensure that applicable water quality standards are attained.

Describe quantified water quality goals, targets, or endpoints: The TMDL must establish numeric endpoints for the water quality standards, including beneficial uses to be protected, as a result of implementing the TMDLs. This often requires an interpretation that clearly describes the linkage(s) between factors impacting water quality standards.

Analyze/account for all sources of pollutants: All significant pollutant sources are described, including the magnitude and location of sources.

Identify pollution reduction goals: The TMDL plan includes pollutant reduction targets for all point and nonpoint sources of pollution.

Describe the linkage between water quality endpoints and pollutants of concern: The TMDLs must explain the relationship between the numeric targets and the pollutants of concern. That is, do the recommended pollutant load allocations exceed the loading capacity of the receiving water?

Develop margin of safety that considers uncertainties, seasonal variations, and critical conditions: The TMDLs must describe how any uncertainties regarding the ability of the plan to meet water quality standards that have been addressed. The plan must consider these issues in its recommended pollution reduction targets.

Provide implementation recommendations for pollutant reduction actions and a monitoring plan: The TMDLs should provide a specific process and schedule for achieving pollutant reduction targets. A monitoring plan should also be included, especially where management actions will be phased in over time and to assess the validity of the pollutant reduction goals.

Include an appropriate level of public involvement in the TMDL process: This is usually met by publishing public notice of the TMDLs in a newspaper of general circulation in the area affected by the study, circulating the TMDLs for public comment, and holding public meetings in local communities. Public involvement must be documented in the state's TMDL submittal to EPA Region 9.

In addition, these TMDLs comply with the public notification requirements of A.R.S. Title 49, Chapter 2, Article 2.1: Publication of these TMDLs in the A.A.R. is required per Arizona Revised Statute, Title 49, Chapter 2, Article 2.1 prior to submission of the TMDL to EPA. The Department shall:

1. Prepare a draft estimate of the total amount of each pollutant that causes impairment from all sources that may be added to a navigable water while still allowing the navigable water to achieve and maintain applicable surface water quality standards, and provide public notice and an opportunity for comment in a newspaper of general circulation in the affected area;
2. Publish a notice in the A.A.R. (this notice) of the determination of total pollutant loadings that will not result in impairment, a summary of comments received to the initial TMDL public notice, and the Department's responses to the comments;
3. Make reasonable and equitable allocations among TMDL sources, and provide public notice and an opportunity for comment in a newspaper of general circulation in the affected area;
4. Publish a notice in the A.A.R. (this notice) of the allocations among contributing sources, along with responses to any comments received on the draft allocations in a newspaper of general circulation.

Federal law only requires the submittal of the pollutant loadings to EPA for approval. However, the Department considers the pollutant loadings and the draft allocations to be integrally related and should be presented together to afford the public a complete understanding of the issues, outcomes and recommendations of the TMDL analysis. For that reason, the Department has combined the loadings and allocations in both the public notice in the local newspaper as well as in this publication in the A.A.R.

B. TMDLs for the Lake Mary Region

EXECUTIVE SUMMARY

This Total Maximum Daily Load (TMDL) reflects a regional approach to fish tissue mercury contamination. Five lakes within the lower Little Colorado River watershed in northern Arizona were listed as impaired for mercury in fish tissue between 2002 and 2003. Not only are these five lakes within the same water and airsheds, they are also close to the same elevation 6,500-7,000 ft and located within similar surficial volcanic geology and soils. All five TMDL lakes were created (dams constructed) between 1904 and 1954, display similar water chemistry, contain no known point sources of mercury, and share similar historical land uses. Because of these similarities, they have been treated collectively as to mercury contamination. Some differences do exist, however, most notably lake morphology, periodicity of water level (climate and water management), and fish stocking practices.

The first of the TMDL lakes to be constructed was Lower Lake Mary in 1904 for timber and stock water supply. The remaining four TMDL lakes were constructed in the 1940s and 1950s for similar reasons, although Upper Lake Mary has been used as a supplemental water supply for the City of Flagstaff.

The volcanic soils in the region contain mostly silt and clay and are extremely erodible. A history of extensive timber harvest and grazing, from the late 1800s up through the 1960s, has resulted in some areas with heightened runoff due to loss of topsoil and vegetation. In large part today, the lakes are still surrounded by the Coconino National Forest; present day timber harvest is conducted primarily to control wildfires and livestock grazing is moderate in comparison to the early days. Some private land exists, particularly in the immediate watershed of Upper and Lower Lake Mary. The Cholla coal-fired power plant is located approximately 50 miles east of LMR, but prevailing winds are west to east. Within the potential airshed to LMR, potential aerial sources of mercury are either no longer in operation (e.g., Flagstaff area sawmills and the Clarkdale smelter), or have been modified to minimize or preclude direct release to the atmosphere (Clarkdale Cement Plant). The only mining conducted within the region has been for pumice, cinders, gravel, and limestone.

The fish species which were sampled for mercury include walleye, northern pike, largemouth bass, yellow bass, crappie, channel catfish, bluegill and rainbow trout. Many lakes in the Lake Mary region (LMR) are stocked with trout in the summer, however, the lakes are really cool-water rather than cold-water lakes, so trout populations are not likely to survive from year to year. This TMDL addresses mercury levels in all species, with a focus on walleye as the top predator species. The calculation apportions the 17.5 g fish/day national default consumption rate by trophic level (TL) into: 5.7 g/day of TL-4 fish, 8.0 g/day of TL-3 fish, and 3.8 g/day of TL-2 fish.

There are two critical periods for mercury loading in this region, the monsoon season for intensity of runoff, and the spring snowmelt/runoff season for duration of runoff. Both wet and dry aerial deposition and geologic background mercury concentration were factored into this TMDL. The TMDL model used regional wet and dry air deposition data collected at the Sycamore Canyon Mercury Deposition Network (MDN) station (AZ02). Deep sediment cores, collected at pre-lake construction depths, showed modest geologic levels of mercury that were later confirmed with watershed soil sampling (20-30 ng/g average).

Four different types of models were developed and linked for this project:
- A watershed loading model;
- A lake hydrologic model;
- An in-lake mercury cycling model; and
- Mercury bioaccumulation calculations.

Site-specific biological accumulation factors (BAFs) were used to link model simulated water column concentrations to fish tissue concentrations. Model predictions of average mercury concentrations in adult walleye were made for various levels of anthropogenic input loads to the lakes, through adjusting land use loading and aerial loading rates.

In order to calculate load reductions on a lake system basis, ADEQ used the trophic level-weighted geometric mean approach described in the *Guidance for Implementing the January 2001 Methyl-mercury Water Quality Criterion*, (EPA, 2009). Based on trophic-level weighted geometric mean concentrations, the following reductions in mercury loading are necessary in the LMR to meet the 0.3 mg/kg mercury fish tissue standard.

Lake Mary Complex (Upper and Lower Lake Mary):
- 25 percent reduction in methyl-mercury and
- 32 percent reduction in total mercury.

Soldiers Complex (Soldiers, Soldiers Annex, and Long Lakes):
- 40 percent reduction in methyl-mercury and
- 46 percent reduction in total mercury

The major source of mercury to the lakes in the LMR is atmospheric deposition with some mercury originating from natural geologic materials. As there are no known local atmospheric mercury sources in the LMR, it is not likely that aerial deposition can be significantly reduced in the near future through local efforts. Improvement can be made, however, by reducing soil erosion and transport of organic material from the watersheds. TMDL implementation will focus on decreasing sediment delivery to the lakes, lake level stability and fishery management.

TMDL CALCULATIONS

This section provides the TMDL calculations based on the relationships established by modeling results and the application of trophic-level weighted geometric mean fish tissue concentrations. A TMDL is the maximum allowable daily load that a waterbody can assimilate and still meet water quality, or in this case, fish tissue standards. TMDLs include load allocations (LA) for nonpoint sources, waste load allocations (WLA) for point sources, a margin of safety (MOS) and natural background (NB). TMDL calculations will follow the equation:

$$TMDL = LA + WLA + NB + MOS$$

TMDL calculations have been made using the modeling results for Upper Lake Mary and Soldiers Lake only. The rationale for this is as follows:
- Both of these lakes provide water and fish to the lower lakes within their respective systems so reductions to mercury loading would be realized throughout each lake complex;
- The majority of fish tissue data have been collected from these two lakes; and
- They have the most stable hydrology of all the LMR lakes.

Fish Tissue Criterion and Trophic Considerations

ADEQ formally adopted the 0.3 mg/kg fish tissue criterion in the Arizona Surface Water Quality Standards in January 2009. Modeling was approached conservatively, using the highest trophic level fish in the LMR, the walleye, which shows the greatest accumulation of tissue mercury. Walleye are the top predatory fish, or trophic level 4 species, so they were used to derive target reductions necessary for achieving the 0.3 mg/kg standard in all fish species (Table 11). However, there are many factors affecting mercury bioaccumulation, including sulfate, sulfur-reducing bacteria, dissolved organic carbon, oxidation-reduction potential, and the specific structure and dynamics of a particular trophic system. Fish may fall into one trophic level (TL) category part of the year, or for part of its lifespan, and another category as they age. A juvenile TL-3 or TL-4 can slide down a level; similarly, a very large predator in TL-3 can slide up a level.

EPA cites the need to consider the trophic structure in setting TMDL reduction goals (EPA, 2009). Through application of TL-weighted geometric mean analysis, TMDL reductions reflect more realistic goals that will ensure that the fishery as a whole will meet the tissue criterion. Using the same default TL consumption rates as the fish tissue criterion (EPA, 2001), ADEQ derived reduction goals for LMR by calculating the geometric mean mercury concentration for all species (C_{avg}) within each lake complex and comparing it to the fish tissue standard. The average lake fish tissue concentration was calculated using:

$$C_{avg} = \frac{3.8 \times C_2 + 8.0 \times C_3 + 5.7 \times C_4}{(3.8 + 8.0 + 5.7)}$$

Where:
C_2 = average weighted geometric mean mercury concentration for TL 2
C_3 = average weighted geometric mean mercury concentration for TL 3
C_4 = average weighted geometric mean mercury concentration for TL 4

Fish tissue data were aggregated between the Upper and Lower Lake Mary (Lake Mary complex), and Soldiers, Soldiers Annex and Lower Long Lakes (Soldiers complex). The calculation apportions the 17.5 g fish/day national default consumption rate into: 5.7 g/day of TL-4 fish, 8.0 g/day of TL-3 fish, and 3.8 g/day of TL-2 fish. Table 1 summarizes fish tissue data and shows TL-weighted geometric means for both lake complexes.

Load Reductions

Applying these weighted TL geometric mean values to the formula cited above, yields an average fish tissue concentration of 0.40 mg/kg for the Lake Mary Complex and 0.50 mg/kg for the Soldiers Complex. Approaching TMDL reductions from this weighted approach normalizes the consumption risk, but also normalizes the degree of impairment. The reductions necessary will be the difference between the TL-weighted geometric means and the fish tissue standard of 0.3 mg/kg.

For Lake Mary: 0.3/0.4 = 0.75; need 25 percent reduction in methyl-mercury

For Soldiers: 0.3/0.5 = 0.6; need 40 percent reduction in methyl-mercury

Interpolating from modeled relationships, the methyl-mercury reductions equate to total mercury reductions of 32 percent for the Lake Mary complex and 46 percent for the Soldiers Lake complex. Based on the modeled long-term average water column methyl-mercury concentration to watershed load reductions, the natural background total mercury load equals 13 percent for the Lake Mary complex and 15 percent for the Soldiers Lake complex. An explicit MOS equal to 10 percent of the TMDL value is included in the TMDL calculations (Table 2).

Table 1. TL-weighted Geometric Mean Mercury Concentrations

Lake Mary Complex						
	TL-4	TL-4	TL-3	TL-3	TL-3	TL-2
Fish Species	Walleye	Northern Pike	Yellow Bass	Channel Catfish	Crappie	none
# of samples	9	7	10	2	3	0
Species geometric mean Hg	1.01	0.6	0.13	0.18	0.13	NA
Weighted TL Hg geometric mean	0.80		0.13			NA

Soldiers Lake Complex						
	TL-4	TL-4	TL-4	TL-3	TL-3	TL-2
Fish Species	Walleye	Northern Pike	Largemouth Bass	Channel Catfish	Bluegill	Rainbow Trout
# of samples	17	7	1	2	2	6
Species geometric mean Hg	1.26	0.52	0.36	0.42	0.45	0.08
Weighted TL Hg geometric mean	0.87			0.43		0.09

Table 2. Reductions Needed by Lake Complex

Lake Mary Complex								
% MeHg reduction	% total Hg reduction	Current total Hg load (g)	TMDL (g/yr)	WLA (g/yr)	LA (g/yr)	NB (g/yr)	MOS (g/yr)	TMDL (g/day)
25%	32%	434	295	0	209	56	30	0.80
Soldiers Complex								
% MeHg reduction	% total Hg reduction	Current total Hg load (g)	TMDL (g/yr)	WLA (g/yr)	LA (g/yr)	NB (g/yr)	MOS (g/yr)	TMDL (g/day)
40%	46%	235	127	0	79	35	13	0.36

LMR TMDL ALLOCATIONS

There are no known local watershed point sources or aerial point sources of mercury currently operating within the LMR. Past emissions from sawmills in Flagstaff and Clark Valley, in which Lake Mary is located, may have contributed mercury through aerial deposition between the 1880s and 1970s but these loads were not quantified. Additional historic contributions may have been made by smelters and cement plants within northern Arizona. Modeling estimates show approximately 95 percent of mercury in the region is from global sources. The remaining 5 percent is attributed to a combination of regional aerial sources from California, Mexico, and Arizona, including natural geo-

logical background based on REMSAD modeling results.

Most of the mercury that enters the lake comes from surface water runoff, particularly bound to clay sediments. While some mercury is lost to settling, a significant portion appears to remain suspended in the water column where sulfur-reducing bacteria mediate the transformation to methyl-mercury. Fish are exposed to methyl-mercury both directly and indirectly from eating prey containing methyl-mercury.

Analysis of the trophic distribution of fish tissue concentration demonstrates that, overall, both lake complexes are not meeting the 0.3 mg/kg fish tissue target for mercury. The level of reduction necessary to reach this target appears dependent upon which species are prominent and their trophic status.

Load reductions necessary to meet the fish tissue criterion have been established through modeling and empirical evidence. Because there are no known point sources of mercury in the LMR watershed, the WLA in all calculations is equal to zero. A MOS is implicitly contained within the conservative BAF used in modeling and explicitly by allocating 10 percent of the TMDL to MOS. The final TMDL allocations for each lake complex are shown below:

Lake Mary Complex:

TMDL = WLA(0) + LA(0.57 g/day) + NB*(0.15 g/day) + MOS(0.08 g/day) = 0.80 g/day

Soldiers Lake Complex:

TMDL = WLA(0) + LA (0.22 g/day) + NB*(0.10 g/day) + MOS(0.04 g/day) = 0.36 g/day

*NB = Natural Background

CRITICAL CONDITIONS

There are two critical loading conditions for mercury bound to soils within the watersheds: winter rain on snow events, and summer monsoon rains. Aerial deposition occurs during both wet periods and dry periods. Conversion of other forms of mercury to methyl-mercury occurs primarily in warm summer months within the lakes. This occurs primarily under reducing conditions, when dissolved oxygen is low, and sulfate-reducing bacteria use sulfate and dissolved organic carbon as energy sources to make the conversion.

IMPLEMENTATION

A.R.S. § 49-234, paragraphs G, H, & J requires TMDL implementation plans (TIPS) to be written for those navigable waters listed as impaired and for which a TMDL has been completed pursuant to Section 303(d) of the Clean Water Act. Implementation plans provide a strategy that explains "how the allocations in the TMDL and any reductions in existing pollutant loadings will be achieved and the time frame in which compliance with applicable surface quality standards is expected to be achieved." Due to the nonpoint source nature of pollutants within the LMR, implementation of a TIP is voluntary and relies upon active stakeholders to implement projects necessary to achieve load reductions.

The primary stakeholders in the LMR include the Coconino National Forest, the Arizona Game and Fish Department, the City of Flagstaff, local residents and those interested in recreation. ADEQ will prepare a TIP within six months of TMDL approval. The TIP will focus on education and best management practices to control erosion, as well as fisheries management for protection of both humans and wildlife. The TIP will also further address the residual 5 percent of the aerial load assigned to southwest regional aerial deposition.

PUBLIC PARTICIPATION

Stakeholder and public participation for the LMR mercury TMDL has been encouraged and received throughout the development of the TMDL. ADEQ has extended opportunities for input from the watershed groups, local residents, governmental agencies, and other interested parties related to their opinions and suggestions regarding the TMDL study and findings, current and future implementation plans, data collection, and the level of involvement that they might contribute to the decision making process. ADEQ staff coordinated and communicated with staff from Arizona Game and Fish Department (AGFD) and the Coconino National Forest on a regular basis as the TMDL was developed by attending watershed group meetings, sharing sample results, and presented various phases of TMDL modeling.

There were three public meetings held in Flagstaff for this TMDL: September 29, 2005, December 15, 2005, and September 9, 2008. A 30-day public comment period was held beginning June 23 and ending on July 23, 2010. A public notice was published in the *Arizona Daily Sun*, a newspaper of general circulation in Flagstaff, on June 23 notifying local residents of the start of the public comment period. Additional notices were sent via e-mail and posted on the ADEQ website. The draft report was made available via the internet and by mail, if requested. Comments were received from the EPA Region 9. Summary comments and responses follow:

RESPONSE TO COMMENTS SUBMITTED by EPA REGION 9 (7/23/10)

Comment #1. We recommend the source analysis be expanded to address (and eliminate as appropriate) other commonly significant mercury sources only briefly acknowledged (see TMDL bottom of page 24 and conclusions), such as: historic or ongoing mining activities; forest fires (e.g., spring/summer fire season for the Coconino National Forest); waste incinerators; coal burning power plants; cement kilns; sawmills; and smelters. Some pollutant loadings from these local sources may be controlled by ADEQ or state regulations.

Response to #1: The final TMDL includes an expanded discussion of past and present mercury sources, in particular, sawmills, wood treatment, and fires. Other potential sources, historic and current, are shown on a map.

Comment #2. EPA suggests that ADEQ consider revising the TMDL to remove Kinnickinick Lake as a background waterbody. EPA understands that Kinnickinick Lake had average fish tissue mercury values of 0.35 mg/kg (based on 5 catfish). While this data supports the TMDL conclusion that atmospheric deposition, not local inputs, is the primary source of mercury, it also demonstrates that Kinnickinick Lake does not represent a background waterbody.

Response to #2: ADEQ agrees; Kinnickinick Lake has been removed from consideration as a background lake.

Comment #3. Regarding natural background soil values, please expand the text referencing Table 11(on page 53), to describe how these values were incorporated into calculations of necessary load reductions, which determined "that the natural background total mercury load equals 13 percent for the Lake Mary complex and 15 percent for the Soldiers Lake Complex."

Response to #3: The referenced text has been expanded in the final TMDL. Background soil mercury was conservatively set at 30 ng/g, which was the average value found in the bottom of the lake sediment cores; the average upland soil mercury was 23 ng/g. The explanation preceded Table 11 in Section XI (C) paragraph 2 of the TMDL report but as noted, has been expanded.

Comment# 4. TMDL load reductions are presented in Table 13. EPA recommends ADEQ add a discussion of monitoring recommendations (e.g., where to monitor and if methyl-mercury or total mercury should be monitored) to evaluate load reductions.

Response to #4: Recommendations for monitoring will be included in the TMDL Implementation Plan. ADEQ will include tributary and lake monitoring, as well as fish tissue monitoring.

Comment #5. The TMDL should include both an uncertainty analysis and a discussion of Margin of Safety (MOS) for the various steps in the TMDL process. The draft TMDL does not contain an uncertainty analysis. The document acknowledges MOS, stating 10 percent of the TMDL value is allocated to an explicit MOS, and MOS is "implicitly contained with the conservative BAF used in modeling." Please describe how the BAF used is conservative, and expand the MOS discussion to address other aspects of this TMDL, such as the modeling analyses.

Response to #5: The final TMDL includes a summary of uncertainties, translated to either explicit or implicit Margins of Safety. The BAF used in modeling was conservative, as it reflected the highest trophic level predatory fish, the walleye. If the top predator meets the 0.3 mg/kg fish tissue target, it is assumed that lower trophic level fish will also meet the target.

Comment #6: The TMDL document identifies seasonal variations related to maximum runoff period and thus sediment loading to the lakes. (EPA notes the time periods described do not seem to be consistent throughout the document, identifying maximum precipitation and erosion as occurring with winter storm events, or during snowmelt runoff in late spring, or during the monsoon period of July to September.) It does not appear that calculated loading allocations were developed to reflect seasonal variations in loading. EPA recommends that such seasonal variation be factored into the implementation plan developed by ADEQ (see next comment).

Response to #6: There are two critical periods of sediment-borne mercury loading to LMR lakes: brief and variably intense rains from July to September, and rain on snow events in the winter/spring season. Because data indicated that overall, the winter/spring season contributed more mercury, the runoff model was calibrated to that season. The final TMDL clarifies this point. However, where sediment stabilization is recommended, monitoring will be required in both critical seasons.

Comment #7. EPA notes that this document is lacking a TMDL implementation plan (TIP) and that ADEQ will create a TIP at a later date. EPA recognizes the complexity of a plan dealing with mercury and hopes that a detailed and effective plan will be forthcoming in the near future. If a TIP is not included with the TMDL submittal to EPA, EPA would like ADEQ to include a commitment to a timeline for completing a TIP, to ensure that an implementation plan is created sooner than later.

Response to #7: ADEQ has amended its FY11 Workplan to include the LMR Implementation Plan for completion within six months from TMDL approval.

Comment #8. For the convenience of the reader, we recommend that the document present all applicable numeric and narrative water quality standards in one location, such as a table. Additionally, please provide the waterbody identification numbers for the waterbodies address by this document, for example by amending Table 1.

Response to #8: Section VIII of the TMDL discussion of numeric and narrative targets has been combined into one table. Waterbody identification numbers will be added to Table 1.

Comment #9. Discussion of the model and related technical information may be best summarized in this document, and calculations moved to an appendix. Below are a few suggestions and detailed comments regarding modeling and related technical information:

a. The discussion of the REMSAD model (pages 24 and 25) - deposition analysis in the REMSAD system is conducted using three global-scale models and two continental-scale models to both derive boundary conditions and likely background conditions from other countries. Emissions (deposition) output are provided with comparisons of global background contributions from both REMSAD and CMAQ models.

Response #9a: Reserved for further discussions with EPA

b. It would be helpful if ADEQ would make referenced modeling reports available in appendices or on the ADEQ website for easy access by readers (e.g., the Lake Mary Regional TMDL Data Summary Report by Malcolm Pirnie, 2005).

Response #9b: The Lake Mary Regional TMDL Data Summary Report, dated August 2005, will be made available, as well as other reports or memoranda from the TMDL contractor.

c. It is not clear how BAF calculated values (Table 9) were derived or converted to units of mg/kg. Also, there appear to be errors in Table 8, for the log BAF values for Lower Lake Mary (6.57 instead of 5.57) and Soldiers Lake Annex (5.597 instead of 4.60).

Response #9c: BAF values using Brumbaugh were based on the equation:

$$\text{Ln [Hg-fish (mg/kg)/length (m)]} = 0.4923 * \text{Ln [MeHg}_{water}\text{ (ng/L)]} + 1.2189$$

Lake-specific BAF values were calculated using the equation: $BAF = C_T / C_W * 10^6$. The headings in Table 9 have been clarified to reflect that the resulting values in the table are not BAFs but tissue concentrations based on modeling using Brumbaugh or the site-specific BAF approach. The Brumbaugh results were all lower than lake-specific fish tissue concentrations, so that method was rejected. Using the lake-specific BAF approach, the predicted tissue concentration for Soldiers Lake was too high, and for Lower Long Lake it was too low. When Malcolm Pirnie applied the BAF from Upper Lake Mary to the Soldiers and Lower Long lakes, the predicted results for mercury in fish tissue came closest to actual average walleye tissue mercury from each lake. Therefore, the resulting BAF, used for all lakes, is the Upper Lake Mary BAF of 6.16E+06 L/kg. Table 10 confuses the issue and has been removed from the final TMDL.

4. Name and address of agency personnel with whom persons may communicate:

Name:	Susan Fitch, TMDL Unit
Address:	Department of Environmental Quality 1110 W. Washington St. Phoenix, AZ 85007
Telephone:	(602) 771-4541 (in Arizona: 1-800-234-5677; ask for seven-digit extension)
Fax:	(602) 771-4528
E-mail:	fitch.susan@azdeq.gov

Copies of the revised draft TMDL may be obtained from the Department by contacting the numbers above. The draft TMDL may also be downloaded from the Department's web site at: http://www.azdeq.gov/environ/water/assessment/download/status-6-21-10.pdf.

5. The time during which the agency will accept written comments and the time and place where oral comments may be made:

There is no public comment period associated with this Notice; the Department previously provided an opportunity for comment on the proposed TMDLs.

NOTICE OF PUBLIC INFORMATION

DEPARTMENT OF ENVIRONMENTAL QUALITY

[M10-336]

1. A.R.S. Title and its heading: 49, The Environment
A.R.S. Chapter and its heading: 2, Water Quality Control
A.R.S. Article and its heading: 2.1, Total Maximum Daily Loads
Section: A.R.S. § 49-234, Total maximum daily loads; implementation plans

2. The public information relating to the listed statute:

Pursuant to A.R.S. § 49-234, the Arizona Department of Environmental Quality (Department or ADEQ) is required to develop a total maximum daily load (TMDL) for navigable waters that are listed as impaired. The purpose of this notice is to publish the Department's determinations of total pollutant loadings for TMDLs in Oak Creek and Spring Creek that the Department intends to submit to the Regional Administrator of Region 9, U.S. Environmental Protection Agency (EPA) for approval.

The Department previously provided public notice and an opportunity for public comment on the draft "Oak Creek and Spring Creek Total Maximum Daily Loads for *Escherichia coliform*" in *The Red Rock News*, a newspaper of general circulation in Sedona, on June 23, 2010. The public comment period ended on July 23, 2010. The Department received comments from the EPA, City of Sedona, and a local resident. The purpose of this notice is to satisfy A.R.S. §§ 49-234(D) and 49-234(E), which require the Department to publish in the *Arizona Administrative Register* (A.A.R.) the determination of total pollutant loadings that will not result in impairment and the proposed allocations among the contributing sources that are sufficient to achieve the total pollutant loadings.

3. Total Maximum Daily Loads (TMDLs):

A. TMDL Process

A TMDL represents the total load of a pollutant that can be assimilated by a waterbody on a daily basis and still meet the applicable water quality standard. The TMDL can be expressed as the total mass or quantity of a pollutant that can enter the waterbody within a unit of time. In most cases, the TMDL determines the allowable mass per time (i.e. pounds per day) of a pollutant and divides it among the various contributors in the watershed as wasteload allocations (WLA) (i.e., point source discharge) and load allocations (LA) (i.e., nonpoint source). The TMDL must also account for natural background sources and provide a margin of safety. For nonpoint sources such as accelerated erosion or internal nutrient cycling, it may not be feasible or useful to derive a figure in terms of pounds per day. In such cases, a percent reduction in pollutant loading may be proposed.

In Arizona, as in other states, changes in standards or the establishment of site-specific standards are the result of ongoing science-based investigations or changes in toxicity criteria from EPA. Changes in designated uses and standards are part of the surface water standards triennial review process and are subject to public review. Standards are not changed simply to bring the waterbody into compliance, but are based on sound science that includes evaluation of the risk of impact to humans or aquatic and wildlife. Existing uses of the waterbody and natural conditions are considered when standards for specific water segments are established.

These TMDLs meet or exceed the following EPA Region 9 criteria for approval:

Plan to meet State Surface Water Quality Standards: The TMDLs include a study and a plan for the specific pollutants that must be addressed to ensure that applicable water quality standards are attained.

Describe quantified water quality goals, targets, or endpoints: The TMDL must establish numeric endpoints for the water quality standards, including beneficial uses to be protected, as a result of implementing the TMDLs. This often requires an interpretation that clearly describes the linkage(s) between factors impacting water quality standards.

Analyze/account for all sources of pollutants: All significant pollutant sources are described, including the magnitude and location of sources.

Identify pollution reduction goals: The TMDL plan includes pollutant reduction targets for all point and nonpoint sources of pollution.

Describe the linkage between water quality endpoints and pollutants of concern: The TMDLs must explain the relationship between the numeric targets and the pollutants of concern. That is, do the recommended pollutant load allocations exceed the loading capacity of the receiving water?

Develop margin of safety that considers uncertainties, seasonal variations, and critical conditions: The TMDLs must describe how any uncertainties regarding the ability of the plan to meet water quality standards have been addressed. The plan must consider these issues in its recommended pollution reduction targets.

Provide implementation recommendations for pollutant reduction actions and a monitoring plan: The TMDLs should provide a specific process and schedule for achieving pollutant reduction targets. A monitoring plan should also be included, especially where management actions will be phased in over time to assess the validity of the pollutant reduction goals.

Include an appropriate level of public involvement in the TMDL process: This is usually met by publishing public notice of the draft TMDLs in a newspaper of general circulation in the area affected by the study, circulating the draft TMDLs for public comment, and holding public meetings in local communities. Public involvement must be documented in the state's final TMDL submittal to EPA Region 9.

In addition, these TMDLs comply with the public notification requirements of A.R.S. Title 49, Chapter 2, Article 2.1: Publication of these TMDLs in the A.A.R. is required per Arizona Revised Statute, Title 49, Chapter 2, Article 2.1 prior to submission of the TMDL to EPA. The Department shall:

1. Prepare a draft estimate of the total amount of each pollutant that causes impairment from all sources that may be added to a navigable water while still allowing the navigable water to achieve and maintain applicable surface water quality standards, and provide public notice and an opportunity for comment in a newspaper of general circulation in the affected area;
2. Publish a notice in the A.A.R. (this notice) of the determination of total pollutant loadings that will not result in impairment, a summary of comments received to the initial TMDL public notice, and the Department's responses to the comments;
3. Make reasonable and equitable allocations among TMDL sources, and provide public notice through the issuance of draft TMDL and an opportunity for comment in a newspaper of general circulation in the affected area;
4. Publish a notice in the A.A.R. (this notice) of the allocations among contributing sources, along with responses to any comments received on the draft allocations in a newspaper of general circulation.

Federal law only requires the submittal of the pollutant loadings to EPA for approval. However, the Department considers the pollutant loadings and the draft allocations to be integrally related and should be presented together to afford the public a complete understanding of the issues, outcomes and recommendations of the TMDL analysis. For

that reason, the Department has combined the loadings and allocations in both the public notice in the local newspaper as well as in this publication in the A.A.R.

B. TMDLs for Oak Creek and Spring Creek

EXECUTIVE SUMMARY

Oak Creek and the red rocks of Sedona are popular tourist destinations in central Arizona. Due to the large number of visitors, the water quality of Oak Creek has been extensively studied with concerns being raised as early as the 1970s. The ADEQ 2006/08 305(b) Assessment Report lists five reaches of Oak Creek and one reach of Spring Creek as impaired for exceeding the *Escherichia coliform* (*E. coli*) water quality standard. Previous studies identified recreational users, septic systems, wildlife, and domesticated animals as potential sources of fecal contamination. Although many improvements have been implemented in the watershed, exceedances of water quality standards still occur on a regular basis.

ADEQ completed a Pathogen TMDL in 1999 for Slide Rock State Park (SRSP) which called for a 30 percent reduction in summer recreational season *E. coli* values in order to attain the water quality standard of 580 colony forming units per 100 milliliters (cfu/100ml). Subsequently the standard was revised to its current single sample maximum (SSM) value of 235 cfu/100ml and geometric mean of 126 cfu/100ml. Continuing exceedances caused ADEQ to undertake a revision to the TMDL beginning in 2003. Sampling occurred on high visitation weekends, during stormwater runoff and snowmelt events, and under baseflow conditions. The TMDLs calculated in this document supersede and replace the 1999 Pathogen (fecal coliform and *E. coli*) TMDL for SRSP.

The TMDLs are based on attaining the 235 cfu/100ml SSM and 126 cfu/100ml geometric mean water quality standards. Load Duration Curves (LDC) were developed to determine reductions necessary to attain the SSM water quality standard under different flow regimes. Based on the TMDL analysis the geometric mean standard is being attained in all of the stream segments. The LDCs provide a visual display of the relationship between stream flow, loading capacity, and water quality data. The TMDL value was arrived at by calculating the median LDC load for each flow category, then comparing the 90th percentile value of the *E. coli* data to determine the current conditions within the flow category. If the 90th percentile value is greater than the TMDL a reduction is needed. TMDL allocations were calculated for each flow category within the LDC where the existing load exceeds the TMDL. If the existing load is less than the TMDL the reach is meeting the TMDL under that flow condition and no load allocation (LA) or waste load allocation (WLA) allocations were calculated. Table 1 summarizes the flow categories that require load reductions and the corresponding percent reductions necessary. Spring Creek lacked sufficient data to develop a LDC so percent reductions were calculated on a SSM concentration basis for wet (high flow) and dry conditions only. A 70 percent reduction is required under wet conditions while the TMDL is being attained under dry conditions along Spring Creek.

Exceedances routinely occur seasonally during the summer recreational months (May to September). These exceedances are depicted under the dry conditions and low flow LDC regimes. Recreational use drops significantly as water temperatures decrease resulting in no observed exceedances under low flow, cool weather conditions. Stormwater runoff and spring snowmelt increase flows within the streams and may result in increased *E. coli* concentrations as fecal material is carried in to the streams via overland flow. These exceedances are typically shown under the high flow, moist conditions, and midrange flow categories on the LDCs. Critical conditions resulting in exceedances, therefore, are high recreational use and increased flows resulting from precipitation events and spring runoff.

Table 1. Summary of Percent Load Reductions

Segment	High Flows	Moist Conditions	Midrange flows	Dry Conditions	Low Flows
Headwaters to West Fork	96%	-[1]	42%	-[1]	-[1]
West Fork To Slide Rock	-[1]	21%	-[1]	-[1]	-[1]
SRSP	-[1]	21%	-[1]	2%	12%
SRSP to Dry Creek	93%	5%	68%	-[1]	9%
Dry Creek to Spring Creek	94%	-[1]	51%	34%	25%
Spring Creek	70%	-[NC]	-[NC]	-[1]	-[NC]

1 - Existing load meets TMDL
NC- Not calculated

Exceedances routinely occur seasonally during the summer recreational months (May to September). These exceedances are depicted under the dry conditions and low flow LDC regimes. Recreational use drops significantly as water temperatures decrease resulting in no observed exceedances under low flow, cool weather conditions. Stormwater runoff and spring snowmelt increase flows within the streams and may result in increased *E. coli* concentrations as fecal material is carried in to the streams via overland flow. These exceedances are typically shown under the high flow, moist conditions, and midrange flow categories on the LDCs. Critical conditions resulting in exceedances, therefore, are high recreational use and increased flows resulting from precipitation events and spring runoff.

In 2009 the Oak Creek Canyon Watershed Council (OCWC), formerly the Oak Creek Canyon Task Force, a local watershed improvement group, was awarded a Water Quality Improvement Grant by ADEQ. The main goal of the grant is to develop a Watershed Improvement Plan (WIP). Though several improvement projects have been implemented over the years to improve the water quality in Oak Creek the effectiveness and necessity of these projects has been questioned due to continued water quality exceedances. Development of the WIP will include watershed and social surveys aimed at locating and prioritizing future water quality improvement projects. The document will act as a blueprint for improving water quality in Oak Creek.

TMDL CALCULATIONS

The following sections describe how the TMDLs were calculated for each of the six individual impaired reaches. The TMDLs are based upon attaining the concentration based SSM water quality *E. coli* standard of 235 cfu/100ml. All stream segments are attaining the 126 cfu/100ml geometric mean standard, therefore, no TMDLs or load reductions based on this standard were calculated. Included within each reach discussion are the LDC and TMDL calculations necessary to attain the SSM. The TMDL value was arrived at by calculating the median LDC load for each flow category, then comparing the 90th percentile value of the *E. coli* data to determine the current conditions within the flow category. If the 90th percentile value is greater than the TMDL a reduction is needed. TMDL load reductions were calculated for each flow category within the LDC where the existing load exceeds the TMDL. If the existing load is less than the TMDL the reach is meeting the TMDL under that flow condition and no LA or WLA allocations were calculated.

The units for the applicable *E. coli* standards and the individual samples results are expressed as cfu/100ml. The TMDL calculations are expressed as billion cfu/day (G-cfu/day) in order to illustrate a quasi mass per time numeric TMDL target. In order to convert concentration in cfu/100ml to G-cfu/day they were multiplied by the discharge rate (cfs) and a conversion factor of 0.02446.

The TMDLs, allocations and load reductions calculated for the five impaired reaches of Oak Creek and the Spring Creek segment are derived from the SSM concentration-based water quality standard. The Oak Creek and Spring Creek TMDLs, Allocations and Load Reductions section describes the mass-based LDC approach used to estimate the reductions necessary for the Oak Creek segments to attain the SSM water quality standard. Load reductions for Spring Creek are simple percent reductions needed to attain the SSM standard.

MARGIN OF SAFETY

The purpose of Margin of Safety (MOS) is to provide for variability in the natural system along with uncertainty in analytical results and assumptions made in the data analysis. An explicit MOS equal to 10 percent of the TMDL will be applied to each flow category calculation.

OAK CREEK AND SPRING CREEK TMDLS, ALLOCATIONS AND LOAD REDUCTIONS

Oak Creek- Headwaters to West Fork Oak Creek (HUC 15060202- 019)

The headwaters to West Fork Oak Creek segment (7.4 miles) of Oak Creek was listed as impaired in the 2006/08 Assessment Report for two exceedances of the *E. coli* SSM water quality standard. Since 1998, 110 *E. coli* samples have been collected from this segment. Four samples have exceeded the applicable water quality standard since 2003. Two of the exceedances were clearly related to storm flows as they plot on the left hand portion of the LDC at 0.01 percent flow (Figure 1). Although the other two exceedances plot in the midrange and low flow portions of the LDC, field observations indicate that these samples reflect the influence of isolated, local precipitation events. The events were insufficient to significantly increase flows but were sufficient enough to raise turbidity and *E. coli* levels. To illustrate, an exceedance was measured in the morning of Sept. 4, 2004 after a minor rain event in the upper watershed. Turbidity was measured at 282 nephelometric turbidity units (NTU) and *E. coli* equaled 1203 cfu/100ml at a discharge of 0.48 cfs. Later the same day, when another sample was collected at approximately the same discharge rate, turbidity equaled 2.7 NTU and *E. coli* had fallen to 32.8 cfu.

Figure 1 and subsequent LDC figures appear to have many data points which create a vertical “bar” on the graphs. This is a reflection of numerous data points collected at approximately the same flow value over holiday weekends. During these sampling events multiple samples were collected from the same site throughout the day. Since there were no observed stormwater inputs between sampling events the measured discharge rates were nearly identical.

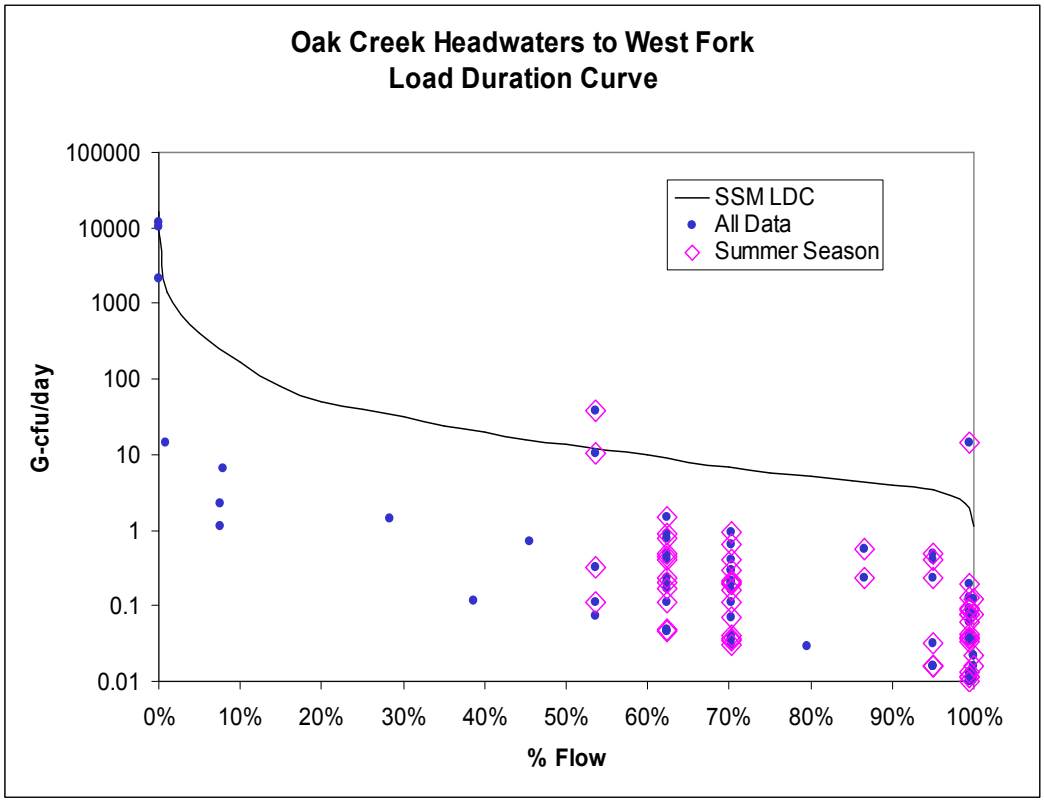

Figure 1. Headwaters to West Fork Oak Creek SSM LDC

Table 2 summarizes the TMDL calculations for the Headwaters to West Fork Oak Creek segment based upon the SSM standard. The segment meets the TMDL under the low flow, dry condition, and moist condition categories but exceeds under midrange and high flows. Reductions of approximately 96 percent under high flow conditions and 42 percent under midrange flows are needed to meet the TMDLs. The data indicate that recreational users are not directly impairing the creek in the upper portion of the canyon as the TMDL is only exceeded under wet conditions. Geometric mean values for each flow regime are 17 cfu/100ml under high flows, 3 cfu/100ml for moist conditions, 14 cfu/100ml under midrange flows, 5 cfu/100ml under dry conditions, and 4 cfu/100ml under low flows. The geometric means were calculated from all of the *E. coli* data within each flow category. No exceedances of the geometric mean standard were observed.

Table 2. TMDL Summary for Headwaters to West Fork

Flow Regime	Existing Load	TMDL	LA	WLA	NB	MOS	% reduction
0-10%	10855	405	292	0	73	41	96
10-40%	1.3	39[1]	-	-	-	-	-
40-60%	24	14	10	0	2.5	1.4	42
60-90%	0.77	5.75[1]	-	-	-	-	-
90-100%	0.20	3.45[1]	-	-	-	-	-

1- Existing load meets TMDL
Units are G-cfu/day, unless otherwise noted

Although direct recreational pollution does not appear to be a consistent source of *E. coli* in the upper watershed, indirect anthropogenic pollution may be a contributing factor. Several residential areas and campgrounds are located within the upper reach in close proximity to the stream. Additionally, pollutants may be introduced via Pumphouse Wash which drains portions of the watershed southeast of Flagstaff. Cattle grazing, domesticated animals and septic systems are present within the Pumphouse Wash portion of the watershed as is the Kachina Village WWTP though it does not discharge to surface water. Increased access to the stream and the potential for greater runoff from these improved sites may contribute pollutants under wet conditions.

Oak Creek- West Fork Oak Creek to SRSP (15060202-18A)

The 5-mile segment of Oak Creek from West Fort of Oak Creek to SRSP was listed as impaired for *E. coli* in the 2006/08 Assessment Report due to three exceedances of the SSM standard within the assessment period. West Fork is a perennial tributary of Oak Creek and drains portions of the Red Rock-Secret Mountain Wilderness Area. As shown in Figure 2 the majority of the data collected for this reach was collected during the summer recreational season. Similar to the Headwaters to West Fork Creek segment, the influence of localized monsoon storms is shown in the monitoring data. On July 30, 2003, a sample was collected at the Halfway Day Use Area which measured 34 cfu/100 ml at a discharge of 9 cfs. Less than two hours later, after a local intense storm, another sample was collected that measured 1733 cfu/100 ml at a discharge of 15 cfs.

TMDL calculations based upon the SSM standard are summarized in Table 3. An insufficient number of samples were collected in order to calculate a 90th percentile value for the high flow category. The one sample collected in the high flow category did not exceed the SSM standard. A reduction equal to 21 percent is only required under moist conditions. The other three flow regimes currently meet the TMDL. Similar to the SSM, the geometric mean for the high flow category could not be calculated. The geometric mean was not exceeded within any flow category and equaled 19 cfu/100ml under moist conditions, 26 cfu/100ml for midrange flows, 16 cfu/100ml under dry conditions, and 65 cfu/100ml under low flows.

Public recreational use within this reach occurs at several USFS day use areas, and various undeveloped areas of access along Highway 89A. Several small private developments and resorts are also located within this segment of Oak Creek. Septage from inadequate or failing septic systems may be contributing to water quality exceedances.

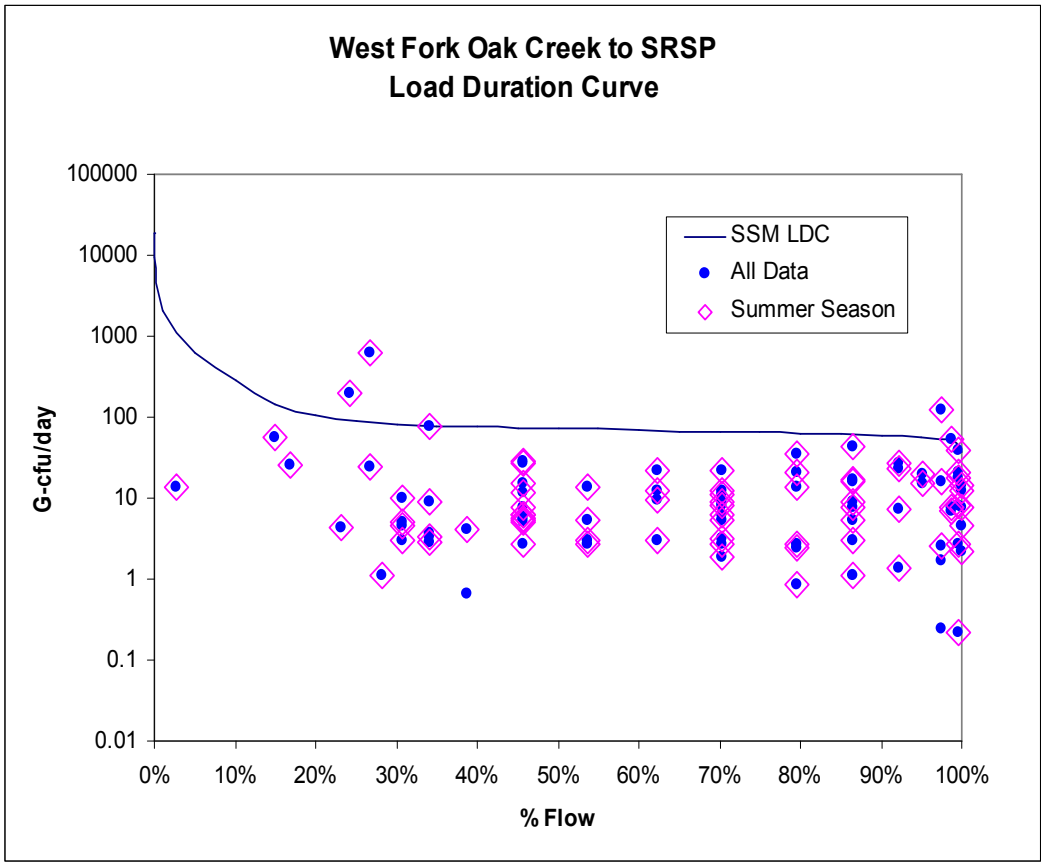

Figure 2. West Fork Oak Creek to SRSP SSM LDC

Table 3. TMDL Summary for West Fork to SRSP

Flow Regime	Existing Load	TMDL	LA	WLA	NB	MOS	% reduction
0-10%	NA	628					
10-40%	113	89	64	0	16	9	21

40-60%	23	71[1]	-	-	-	-	-
60-90%	22	65[1]	-	-	-	-	-
90-100%	34	56[1]	-	-	-	-	-

1- Existing load meets TMDL
Units are G-cfu/day, unless otherwise noted

Oak Creek- SRSP (15060202-18B)

As previously discussed, a TMDL was completed in 1999 for SRSP. The TMDL called for a 30 percent reduction in mean *E. coli* concentrations during the summer recreational season. A total of 58 exceedances (aggregating all SRSP sample sites within a seven-day period) were measured during the 2006/08 assessment period. The data indicate that the SRSP segment still routinely exceeds the SSM standard. As seen in Figure 3 data collection within the park has been extensive but concentrated within the summer season reflecting the SRSP Surface Water Quality Management Plan.

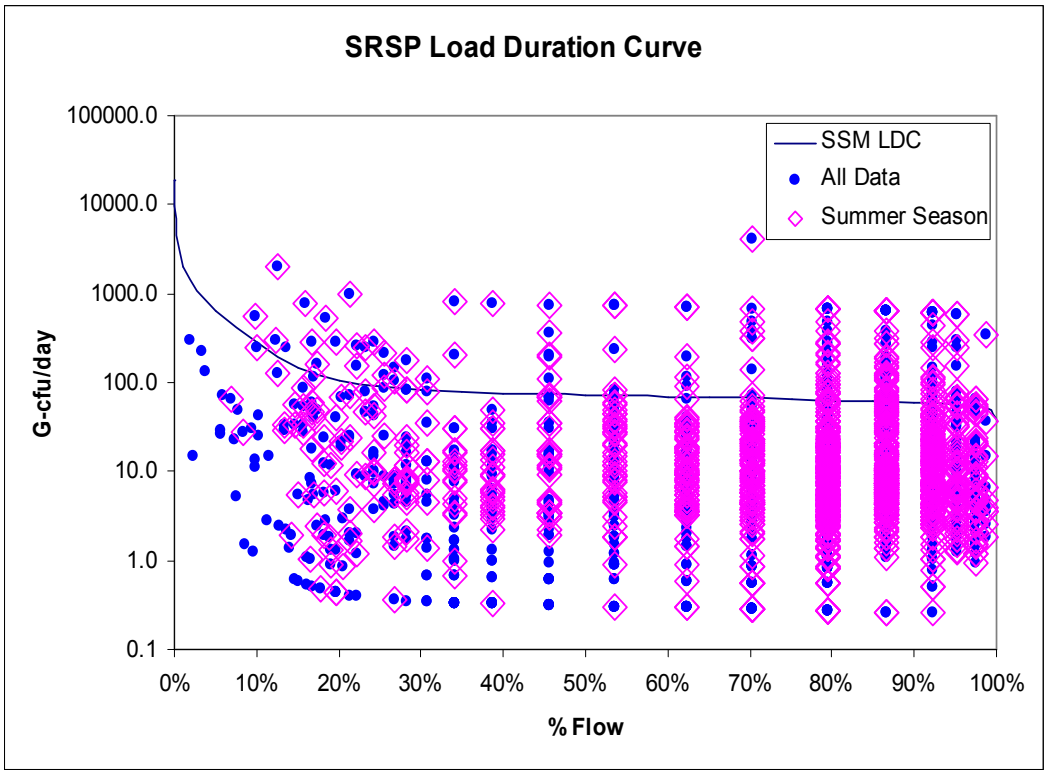

Figure 3. SRSP SSM LDC

Table 4 summarizes the TMDL calculations for SRSP based upon the SSM standard. Unlike the upper two Oak Creek segments discussed above, SRSP requires load reductions under low flow and dry conditions in addition to reductions under moist conditions. Percent reductions are approximately 12 percent, 2 percent, and 21 percent, respectively. The existing loads under low flow and dry conditions are approximately double the existing loads calculated for the West Fork to SRSP segment upstream of the park. This appears to indicate the conditions within or immediately upstream of the park are causing the observed exceedances observed within the park. Recreational users may be introducing contaminants themselves or resuspending *E. coli* from stream sediments. The geometric mean was not exceeded under any flow category. Calculated geometric means are 18 cfu/100ml under high flows, 17 cfu/100ml for moist conditions, 20 cfu/100ml for midrange flows, 30 cfu/100ml under dry conditions, and 41 cfu/100ml under low flows.

SRSP accommodates the highest number of recreational visitors within the Oak Creek watershed. Summer holiday weekends are especially busy when the park routinely reaches its parking capacity. Within the 1-mile stretch of the park recreational visitors and their associated activities appear to be the main source of pollution. The adverse recreational affects result from direct (i.e. dirty diapers) and indirect human pollution (i.e. trash left behind drawing wildlife to creeks edge or resuspension of *E. coli* contained in stream sediments).

Table 4. TMDL Summary SRSP

Flow Regime	Existing Load	TMDL	LA	WLA	NB	MOS	% reduction
0-10%	242	628[1]	-	-	-	-	-
10-40%	112	89	64	0	16	9	21
40-60%	70	711	-	-	-	-	-
60-90%	66	65	52	0	6.5	6.5	2
90-100%	64	56	45	0	6	6	12

1- Existing load meets TMDL
Units are G-cfu/day, unless otherwise noted

Oak Creek- SRSP to Dry Creek (15060202-18C)

The 20 mile SRSP to Dry Creek segment was listed as impaired in the 2006/08 305(b) Assessment Report. Aggregated seven-day data resulted in 23 exceedances observed within the assessment period. The majority of exceedances were measured during the summer recreational season as shown in Figure 4.

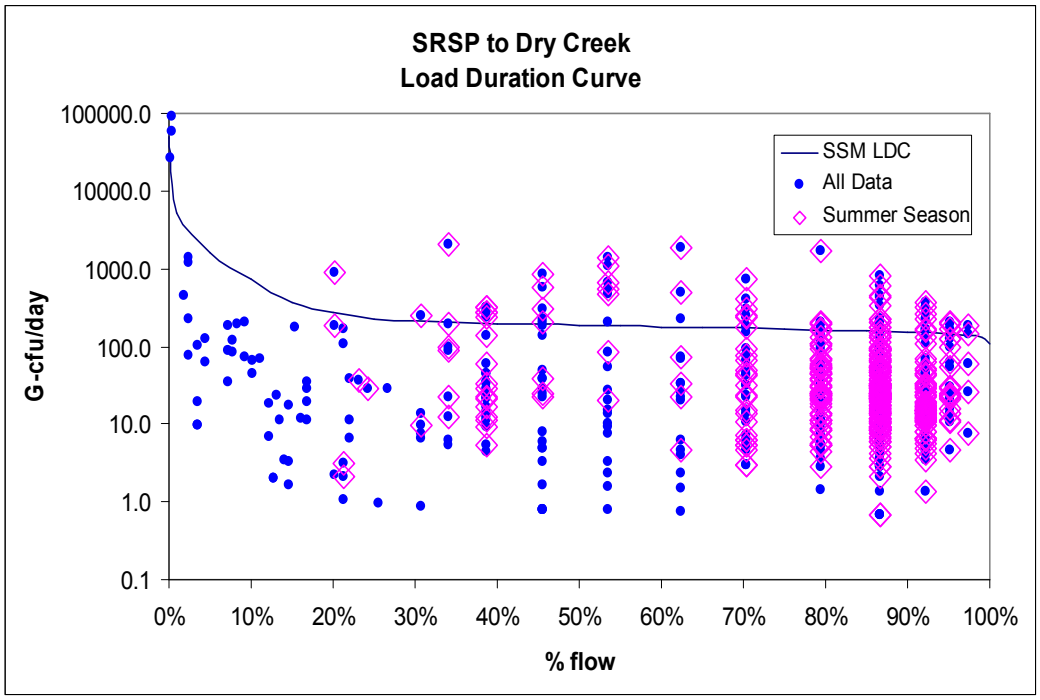

Figure 4. SRSP to Dry Creek SSM LDC

Table 5 summarizes the TMDL calculations, based upon the SSM standard, with load reductions required under all but dry conditions. Reductions equal 93 percent under high flows, 5 percent for moist conditions, 68 percent for midrange flows, and 9 percent under low flow conditions. The WLA includes loads from the Blackman WWTP (4 G-cfu/100ml) and the City of Sedona MS4 permitted discharge. The WLA for the Blackman WWTP is applied to all flow categories. The City of Sedona WLA is equal to 5 percent of the TMDL within the upper three flow categories only. This approach assigns a WLA 84 G-cfu/day for high flows, 12 G-cfu/day under moist conditions and 10 G-cfu/day under midrange flows for the City of Sedona MS4 permit. Geometric means were calculated for each flow category and equaled 26 cfu/100ml for high flows, 21 cfu/100ml under moist conditions, 32 cfu/100ml for midrange flows, 38 cfu/100ml dry conditions, and 38 cfu/100ml under low flow conditions. No exceedances of the geometric mean occurred.

Table 5. TMDL Summary Slide Rock State Park to Dry Creek

Flow Regime	Existing Load	TMDL	LA	WLA	NB	MOS	% reduction
0-10%	23945	1622	1080	88	292	162	93

10-40%	242	230	150	16	41	23	5
40-60%	582	184	118	14	33	18	68
60-90%	163	167[1]	-	-	-	-	-
90-100%	158	144	111	4	14	14	9

1- Existing load meets TMDL
Units are G-cfu/day, unless otherwise noted

This segment of Oak Creek is very diverse in regards to land use and potential sources of *E. coli*. The upper portion lies within Oak Creek Canyon and contains day use areas, a campground, private residences and commercial businesses. Recreational pressure is significantly lower than SRSP but still a potential factor. The middle portion includes the City of Sedona, day use recreational areas, private residences along the stream channel, and permitted dischargers. Below the City of Sedona the creek flows through a relatively undeveloped, gently sloping, wide flood plain with little recreational pressure.

Oak Creek- Dry Creek to Spring Creek (15060202-017)

The 10-mile segment of Oak Creek from Dry Creek to Spring Creek was listed as impaired in the 2006/08 305(b) Assessment due to 12 exceedances of the SSM water quality standard. The LDC for this segment (Figure 5) shows that the majority of the exceedances occurred during the summer season although several were observed outside the recreational season.

Table 6 summarizes the TMDL calculations, based upon the SSM standard, with reductions necessary under all but moist conditions. The calculations include a 0.4 G-cfu/100ml WLA for Sedona Venture applied under all flow categories. Additionally, where applicable, the WLAs from the SRSP to Dry Creek segment (Blackman WWTP and City of Sedona) have been added to the Sedona Venture WLA. Percent reductions are 25 percent under low flow, 34 percent under dry, 51 percent under midrange, and 94 percent under high flow conditions. The geometric mean *E. coli* value was calculated for each flow category with no exceedances observed. Geometric means equaled 102 cfu/100ml, 24 cfu/100ml, 62 cfu/100ml, 82 cfu/100ml, 25 cfu/100ml ranging from high to low flows.

The majority of the land within the this portion of the watershed is undeveloped but there are several developed areas which include ranches located along Oak Creek, the service area of the Sedona Venture WWTP along Dry Creek and the area surrounding Page Springs. Excluding Sedona Venture, these areas utilize septic systems.

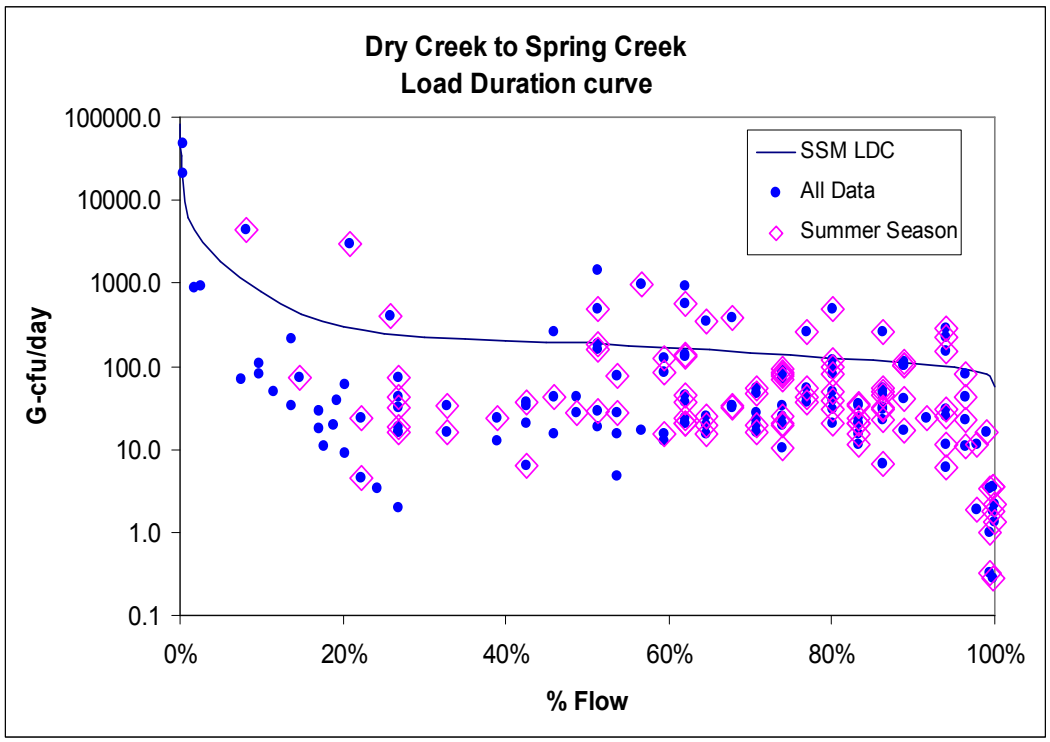

Figure 5. Dry Creek to Spring Creek SSM LDC

Table 6. TMDL Summary Dry Creek to Spring Creek

Flow Regime	Existing Load	TMDL	LA	WLA	NB	MOS	% reduction
0-10%	29558	1794	1203	88	323	179	94
10-40%	129	247[1]	-	-	-	-	-
40-60%	390	190	124	13	34	19	51
60-90%	208	138	110	0.4	14	14	34
90-100%	130	98	73.6	4.4	10	10	25

1- Existing load meets TMDL
Units are G-cfu/day, unless otherwise noted

Spring Creek- Coffee Creek to Oak Creek (15060202-022)

Spring Creek, a tributary of Oak Creek below Page Springs, was listed in the 2006/08 for nine exceedances of the SSM *E. coli* standard. Unfortunately insufficient stream flow data exists to develop a LDC. However, by analyzing the USGS gage station data near Page Springs (09504500) using Base Flow Recession Coefficient Statistics, the Spring Creek samples were determined to have been collected during dry or wet periods. If the analysis indicated that the flow at the gauge station was elevated it was assumed that Spring Creek was experiencing similar conditions. Once the Spring Creek data was separated into wet and dry categories, the 90th percentile values of each data set were calculated and compared to the 235 cfu/100ml SSM *E. coli* standard. The majority (112 samples or 88 percent) of the samples were determined to have been collected under dry conditions with the 90th percentile value equaling 200 cfu/100ml, therefore attaining the SSM standard. The wet condition (16 samples) 90th percentile value equals 779 cfu/100ml requiring a 70 percent reduction to meet the SSM standard. The TMDL for Spring Creek is summarized in Table 7. The TMDL is based on a concentration rather than a load basis due to the fact that a LDC could not be constructed. The geometric mean was calculated for each group of data, 44 cfu/100ml for dry and 69 cfu/100ml under wet conditions, indicating the standard is being attained.

Table 7. TMDL Summary Spring Creek

Condition	Existing (cfu/100ml)	TMDL (cfu/100ml)	LA	WLA	NB	MOS	% reduction
Dry	200	235[1]	-	-	-	-	-
Wet	779	235	169	0	42	24	70

1- Existing load meets TMDL

The Spring Creek watershed is largely undeveloped containing a few small ranches. Recreational use is limited but road crossings provide opportune areas for people to enter the water. Since elevated flows require load reductions, additional information regarding land use and riparian health is needed to determine the source of *E. coli.*

CRITICAL CONDITIONS

The SSM water quality standard is routinely exceeded during the summer recreational season (May to September). The exceedances that occur under dry and low flow conditions on the LDC are typically attributed to recreational users but there are exceptions to this as discussed below. Precipitation events and spring snowmelt are also conditions that result in exceedances of the SSM water quality standard. Exceedances that are related to stormwater or snowmelt typically plot under the high flow, moist conditions, and midrange flow regimes on the LDC.

IMPLEMENTATION

A.R.S. § 49-234, paragraphs G, H, & J requires TMDL implementation plans (TIPS) to be written for those navigable waters listed as impaired and for which a TMDL has been completed pursuant to Section 303(d) of the Clean Water Act. Implementation plans provide a strategy that explains "how the allocations in the TMDL and any reductions in existing pollutant loadings will be achieved and the time frame in which compliance with applicable surface quality standards is expected to be achieved." Due to the largely nonpoint source origin of pollutants within Oak Creek, implementation of a TIP is voluntary and relies upon active stakeholders to implement projects necessary to achieve load reductions.

In 2009 the OCWC, formerly the Oak Creek Canyon Task Force, a local watershed improvement group, was awarded a Water Quality Improvement Grant by ADEQ totaling $311,000. The main goal of the grant is to develop a locally driven WIP. Several improvement projects have been implemented over the years to improve the water quality in Oak Creek but the effectiveness and necessity of these projects has been questioned as water quality exceedances are still occurring. Development of the WIP will include watershed and social surveys aimed at locating and prioritizing future water quality improvement projects. The document will act as a blueprint for improving water quality in Oak Creek. Given the level of detail and planning that the WIP will require, a detailed TIP will not be produced by ADEQ.

Discussed below are some of the Best Management Practices (BMPs) suggested by various stakeholders within the watershed. These will be explored and expanded upon through the WIP development process.

The majority of the water quality exceedances occur during the high recreational use season (May to September). But recreational users are not the only source of contamination to the creek. Wildlife, domesticated animals, septic systems, and WWTP contributions must be considered. Stormwater and spring melt runoff wash in contaminants from the watershed and can result in water quality exceedances. The recreational opportunities within the canyon are wide ranging, from unimproved creekside access points to USFS managed campgrounds. The mere presence of people within the stream may lead to water quality issues but the trash and debris left behind can draw animals to the waters edge also.

Suggested BMPs have included:
- Limiting access to unimproved access points;
- Limit the number of visitors to the canyon itself;
- Provide better access to restroom facilities;
- Provide more trash receptacles for visitors to use;
- Limit domesticated animals water access;
- Provide disposal containers for dog waste;
- Children who are not potty trained are required to wear swim pants;
- Limit or regulate what can be brought to the waters edge;
- Ensure septic systems along the creek are functioning properly;
- Reduce sediment entering the stream during storm events;
- Increase public awareness of water quality and the risks associated with fecal pollution;
- Implement deferred or prescribed grazing methods in upper watershed;

All of these BMPs require land managers, property owners and stakeholder support if they are to be successful.

The OCWC is also continuing focused sampling around suspected failing or inadequate septic systems and other potential source areas. Additionally, they are working with the University of Arizona on the collection and analysis of samples to be used for bacteria source tracking to confirm and expand upon the findings of the NAU genotyping project.

PUBLIC PARTICIPATION

Stakeholder and public participation for the Oak Creek and Spring Creek *E. coli* TMDL has been encouraged and received throughout the development of the TMDL. ADEQ has extended opportunities for input from the watershed groups, local residents, governmental agencies, and other interested parties related to their opinions and suggestions regarding the TMDL study and findings, current and future implementation plans, data collection, and the level of involvement that they might contribute to the decision making process. ADEQ staff coordinated and communicated with the OCWC, Arizona State Parks Department and USFS staff on a regular basis as the TMDL was developed by attending watershed group meetings, providing training, and sharing sample results.

A 30-day public comment period for the draft TMDL was held beginning June 23 and ending on July 23, 2010. A public notice was published in the *Red Rock News*, a newspaper of general circulation in Sedona, on June 23 notifying local residents of the start of the public comment period. Additional notices were sent via e-mail and posted on the ADEQ website. The draft report was made available via the internet and by mail, if requested. Comments were received from the EPA Region 9, the City of Sedona, and a local resident. Summary comments and responses follow:

EPA Comment 1: In 1999, a similar TMDL was approved for only the reaches near Slide Rock State Park. The current document states that these TMDL supersede the 1999 TMDL for pathogens for the Slide Rock State Park reach.

Response 1: ADEQ is pleased to see that any confusion regarding which TMDL will be the basis for measuring improvements in water quality has been rectified.

EPA Comment 2: Section 7.0 provides a useful explanation of the translation from the concentration-based TMDL, expressed as cfu/100ml, to an illustration of a mass per time TMDL target in G-cfu/day (billion cfu/day). It would be helpful to state that this is the numeric target, if that is the intention (p. 25).

Response 2: ADEQ clarified that the TMDL target is indeed a numeric target, see Section 7.0, page 26 of the revised draft document.

EPA Comment 3: Please note it appears the units on the concentration (ml) have been inadvertently left off of the description in the summary (p. 1).

Response 3: The commenter is correct, the units (ml) have been added the text on page 1.

EPA Comment 4: A later section [6.1.1] discusses the Partial Body Contact beneficial use for the Dry Creek to Spring Creek segment of 576 cfu/100 ml. Please clarify whether this is the applicable water quality standard for this reach.

Response 4: The Partial Body Contact beneficial use is applicable to Dry Creek, not Oak Creek. Clarification language was added to Section 6.1.1 of the revised draft.

EPA Comment 5: Also please clarify that Load Duration Curves (LDC) were developed to determine reductions necessary to attain the SSM water quality standard under different flow regimes; whereas TMDL analyses conclude all the reaches are meeting the geometric mean standard.

Response 5: Additional language was added to the Executive Summary and Section 7.0 of the revised draft TMDL to clarify that the single sample maximum (SSM) water quality standard is not being attained whereas the geometric mean standard is being attained. All TMDLs and load reductions are based upon the SSM.

EPA Comment 6: The summary section states (p. 1) that "TMDLs are only calculated where the existing load exceeds the TMDL." In Section 7.0, the document states that the TMDLs are set equal to the concentration-based water quality standards. Did you mean to state that "TMDL *allocations* are only calculated where the existing load exceeds the TMDL"?

Response 6: The commenter is correct, TMDLs were calculated for all stream segments under all flow categories. TMDL allocations were only made when the existing load exceeded the TMDL. Clarification was added the Executive Summary and Section 7.0.

EPA Comment 7: Section 5.1, LDC Analysis (p. 15) states that "ADEQ has chosen to employ a LDC approach in order to determine TMDLs and calculate necessary load reductions." This could potentially confuse the reader, and we would like to suggest the text more clearly state these are *concentration-based TMDLs, so the TMDLs are set equal to the concentration-based water quality standards*. The LDCs are provided as estimates of the necessary reductions at various flow regimes.

Response 7: ADEQ agrees the draft language may have been confusing. The text has been updated as follows "ADEQ has chosen to employ a LDC approach in order to determine TMDLs and calculate load reductions necessary to attain the concentration-based SSM water quality standard."

EPA Comment 8: Sections 7.3 to 7.7 include descriptions of the data analysis and Load-Duration Curves (LDCs) to illustrate the reductions needed for SSM exceedences. Although it is stated in the summary the TMDLs "are based on" the water quality standards, please include a brief introduction to these sections stating that the TMDLs are concentration-based TMDLs, and Sections 7.3 to 7.7 describe the findings in the five segments.

Response 8: The following text has been added to Section 7.0: "The TMDLs, allocations and load reductions calculated for the five impaired reaches of Oak Creek and the Spring Creek segment are derived from the SSM concentration-based water quality standard. All segments are meeting the geometric mean standard. Sections 7.3 to 7.7 describe the mass-based LDC approach used to estimate the reductions necessary for the Oak Creek segments to attain the SSM water quality standard. Load reductions for Spring Creek are simple percent reductions needed to attain the SSM standard."

EPA Comment 9: It would be helpful to include the units in the Tables that list the mass-based translation of the concentration-based TMDLs.

Response 9: The units used in Tables 4-8 are included as a footnote to the table and discussed in Section 7.0.

EPA Comment 10: The wasteload allocations (WLAs) for various flow regimes are included in the TMDL calculation tables. Section 6.1.2 states the Sterling Spring Fish Hatchery is "exempt from AZDPES permit coverage." Please clarify if the WLA is set at 0 for the Sterling Spring Fish Hatchery or is some other value assumed yet will not be incorporated into an AZDPES permit.

Response 10: The last sentence of Section 6.1.2 states "… the hatcheries will not be considered in TMDLs calculations resulting in a WLA equal to zero for these facilities." The hatcheries referred to include Page Springs, Rainbow Trout Farm and Sterling Springs.

EPA Comment 11: The document states that TMDL limitations will be incorporated into the Stormwater Management Program when it is revised, and that "a WLA will be incorporated in to TMDL calculations for MS4 discharges into Oak Creek," set equal to 5 percent of the TMDL within the three top flow categories (i.e., storm-related discharges), based upon the relative area of Sedona, where MS4 discharges are found, to the area of the watershed as a whole. This approach appears reasonable. However, the statement that "the watershed [meets] the 235 cfu/100ml SSM standard as a whole" is confusing, since the SSM standard is not met throughout the Oak Creek watershed; perhaps what was intended was to restate the geometric mean standard is being met, and the WLA applies to higher flow regimes, where the standard is not met? Please clarify this in the final document.

Response 11: ADEQ agrees that the text was confusing and has removed it from the revised draft.

EPA Comment 12: The document does not specifically address seasonal variation and critical conditions, …Apparently, recreational users likely contribute to low flow or dry condition exceedences. Because it appears that these calculations address seasonal variations and critical conditions, we recommend further discussion of these elements, since they are required by federal regulations (CFR 130.7(c)(1)).

Response 12: Additional language was added to the Executive Summary and Section 7.0. The text added to the Executive Summary follows: "Exceedances routinely occur seasonally during the summer recreational months (May to September). These exceedances are depicted under the dry and low flow LDC regimes. Recreational use drops significantly as water temperatures decrease resulting in no observed exceedances under low flow, cool weather conditions. Stormwater runoff and spring snowmelt increase flows within the streams and may result in increased *E. coli* concentrations as fecal material is carried in to the streams via overland flow. These exceedances are typically shown under the high flow, moist conditions, and mid-ranges flow categories on the LDCs. Critical conditions, therefore, are high recreational use and increased flows resulting from precipitation events and spring runoff."

City of Sedona Comment 1: (paraphrased) The commenter recognized that the nonpoint nature of the pollutants will require active stakeholder involvement (Oak Creek Watershed Council) to achieve load reductions. Given the potential number of sources (silt reservoir, humans, and animals) these reductions may take many years to be realized.

Response 1: ADEQ agrees that active stakeholder involvement is important to improving water quality in Oak Creek. As the commenter noted the Oak Creek Watershed Council will play a pivotal role in achieving load reductions.

City of Sedona Comment 2: ADEQ should continue to monitor the levels of *E. coli* in the Unique Waters of Oak Creek to document the success on these measures in depleting the *E. coli* reservoir in the silt.

Response 2: ADEQ will continue to monitor the water quality of Oak Creek through the ambient monitoring program. Additionally, as on-the-ground improvements are made the TMDL program will collect water quality samples to measure the effectiveness of those improvements.

Local resident comment 1: "… the NAU study defined the headwaters of Oak Creek Canyon to be in Fry Canyon. Would you concur?"

Response 1: The headwaters of Oak Creek include Fry Canyon along with Pumphouse Wash and Sterling Canyon. Oak Creek itself is typically shown (i.e. on USGS topographic maps) to begin at the confluence of Sterling Canyon and Pumphouse Wash.

After completion of the 45-day *Arizona Administrative Register* review period, this report will be submitted to the EPA for final approval.

4. Name and address of agency personnel with whom persons may communicate:

Name:	Jason Sutter, TMDL Unit Supervisor
Address:	Department of Environmental Quality 1110 W. Washington St. Phoenix, AZ 85007
Telephone:	(602) 771-4468 (in Arizona: 1-800-234-5677; ask for seven-digit extension)
Fax:	(602) 771-4528
E-mail:	sutter.jason@azdeq.gov

Copies of the revised draft TMDL may be obtained from the Department by contacting the numbers above. The draft TMDL may also be downloaded from the Department's web site at: http://www.azdeq.gov/environ/water/assessment/download/status-6-21-10.pdf

5. The time during which the agency will accept written comments and the time and place where oral comments may be made:

There is no public comment period associated with this Notice; the Department previously provided an opportunity for comment on the proposed TMDLs.

NOTICE OF PUBLIC INFORMATION

LAWS 2010, CH. 287

Revisions to the Rulemaking Process in the Administrative Procedures Act
Extension of the Rulemaking Moratorium Through Fiscal Year 2011

[M10-191]

1. Reason for the Notice of Public Information:

Laws 2010, Ch. 287 revised the Administrative Procedure Act and extended the moratorium on rulemaking through fiscal year 2011

2. Effective date of Laws 2010, Ch. 287:

July 29, 2010

3. Summary of Laws 2010, Ch. 287:

Revises the rulemaking process by expanding the use of summary rulemaking, authorizing a general permit and expanding the role of the governor's Office of Strategic Planning and Budgeting.

Requires the rule's benefits to outweigh its probable costs and the agency to demonstrate it selected the least burdensome and costly alternative. (Strikes the requirement for this to be by clear and convincing evidence).

Expands the requirements for the Economic, Small Business and Consumer Impact Statement.

For the agency's five-year review, requires a determination that the rule imposes the least burden and cost to the regulated community.

During an appeal of an agency rule, outlines an additional reason for filing an objection.

Extends the rulemaking moratorium on rulemaking through fiscal year 2011

(Excerpted from Arizona House of Representatives House Majority Research Memorandum of April 28, 2010. Available online at www.azleg.gov.)

4. Contact for rulemaking moratorium questions:

Communications regarding exceptions to the moratorium, or questions regarding the moratorium generally, should be addressed to Richard Bark, Deputy Chief of Staff, Policy, at rbark@az.gov.

5. Location of full text of Laws 2010, Ch. 287:

The entire text of Laws 2010, Ch. 287 is available online at www.azsos.gov under Legislative Filings.